Early Australian Botany Texts for Schools

Presidential Address delivered at the 140th Annual Meeting, March 18th 2015
by Emeritus Professor Robert J. King.

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In tonight's address I have set myself two basic aims: to introduce some of the early Australian botany textbooks for schools, and to set these in the then prevailing educational environment.

European colonisation of Australia had its beginnings in botany. Australia was to be settled at Botany Bay and entry was to be gained through Capes Banks and Solander. The richness of the flora had led the British to the erroneous conclusion that the Botany Bay environment was especially productive. As Paul Adam has pointed out in his introduction to the plants of the Royal National Park, in the Linnean Society's Field Guide … 'it was to be almost two centuries before the inverse relationship between fertility and plant species richness was recognised as a general global phenomenon' (Adam, 2013).

In the years immediately following European settlement the biology of Australian plants (and animals) excited the imagination of European natural historians and collectors. At first when explorers, sailors and naturalists paid fleeting visits they returned with their trophies to 'home'. In the next period Australian residents sent specimens back to Europe but it was not until the mid-1800s that Australian botanists themselves observed, collected and described Australian plants (Ducker, 1990). By the mid to late 1800s key Australian botanists recognised the importance of genuinely Australian teaching materials and became involved in their publication.

At this time educational practice paid increasing attention to observation rather than copying and rote learning. Herbert Spencer, writing in 1862 on 'Education: intellectual, moral, and physical', wrote of the importance of the study of nature and fundamentals of science and the need to replace rote learning and rule teaching with object lessons. His strong view was that object lessons should include 'the fields and the hedges, the quarry and the seashore'. Over a century and a half ago he wrote 'We are quite prepared to hear from many that all this is throwing away time and energy; and that children would be much better occupied in writing their copies or learning their pence-tables and so fitting themselves for the business of life' (Spencer, 1890).

The transition, between copy books with the discipline and routine they enforced, and an encouragement to make observations, is beautifully illustrated in Vere Foster's Drawing Copy Books, E1, E2, and E3 'Wild Flowers' (Figs.1&2). These books have no publication date; though on the cover testimonials, dated 1871, appear for other copy books in this extensive series. The series recommend themselves in their introductory remarks with the comment that 'a loving appreciation of nature has in all ages characterised the noblest minds'. The books offer exemplars to be copied, but go on to recommend that observations should be made in the field so that a dull and profitless walk can become an opportunity to find objects of interest and study. 'The ultimate aim is to obtain the power of representing Nature to himself'. The advice was to copy - go carefully through the great majority of the sheets but at the same time if possible observe, having 'a piece of the real plant at his side to refer to'.

In Australia this major change, encouraging the involvement of the pupil in the learning process, coincided with a major change in responsibility for education. In New South Wales this was embodied in the Public Instruction Act of 1880, the first acknowledgement by the State that every child, regardless of class, creed or economic circumstances was entitled to an education – education was to be free, compulsory, and secular. In practice it was none of these, but it was a major advance on the earlier state of play. Similar legislation was to be enacted in other States.

In Victoria in the 1870s a wave of interest in the teaching of science was recorded with the Education Minister in 1879 expressing his wish that teachers be qualified to teach in at least one branch of science


WILD FLOWERS.

PRICE THREEPENCE

E1 VERE FOSTER'S DRAWING COPY BOOK E1

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J 2. Beech and Elm
J 3. Ash and Chestnut
K 1, 2, 3, 4. Landscape
M 1, 2, 3, 4. Marine
O 1 Domestic Animals
O 2 Families of Animals
O 3. British Song Birds
O 4. British Wild Animals
O 5, 6. The Horse
O 7. Dogs
O 8. Cattle
O 9. Australian Animals
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Fig. 1. Front cover of Vere Foster's Drawing Copy Book E1 'Wildflowers'

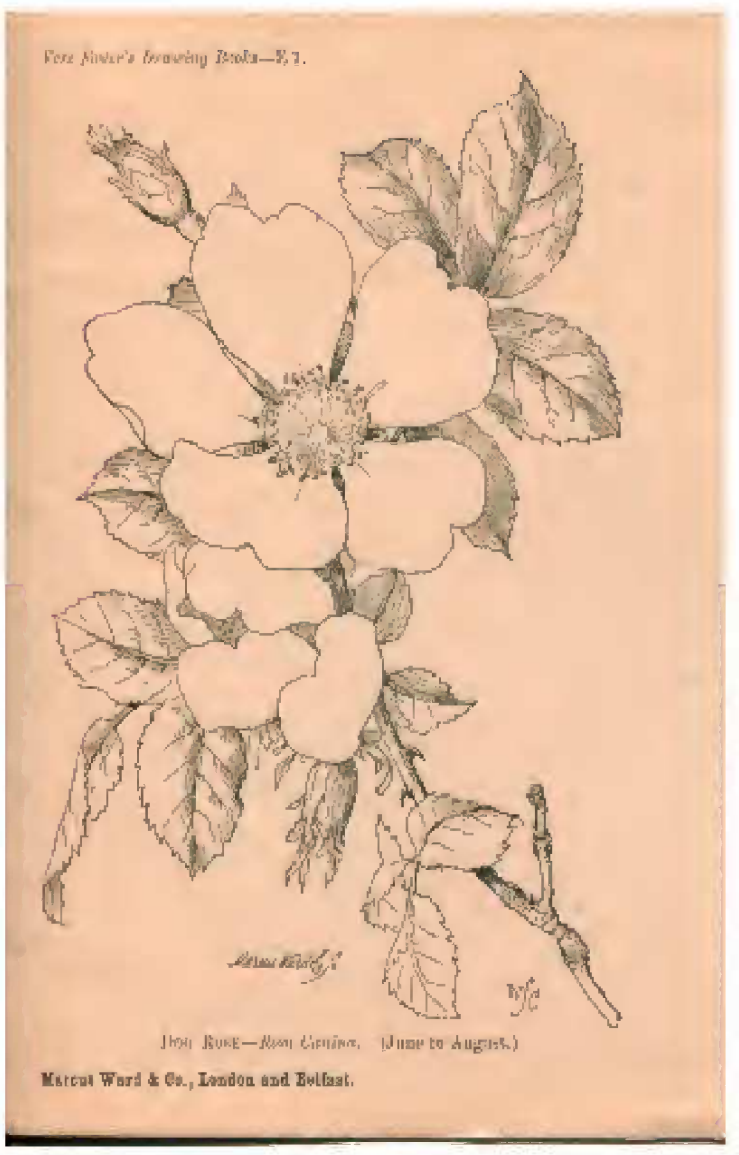
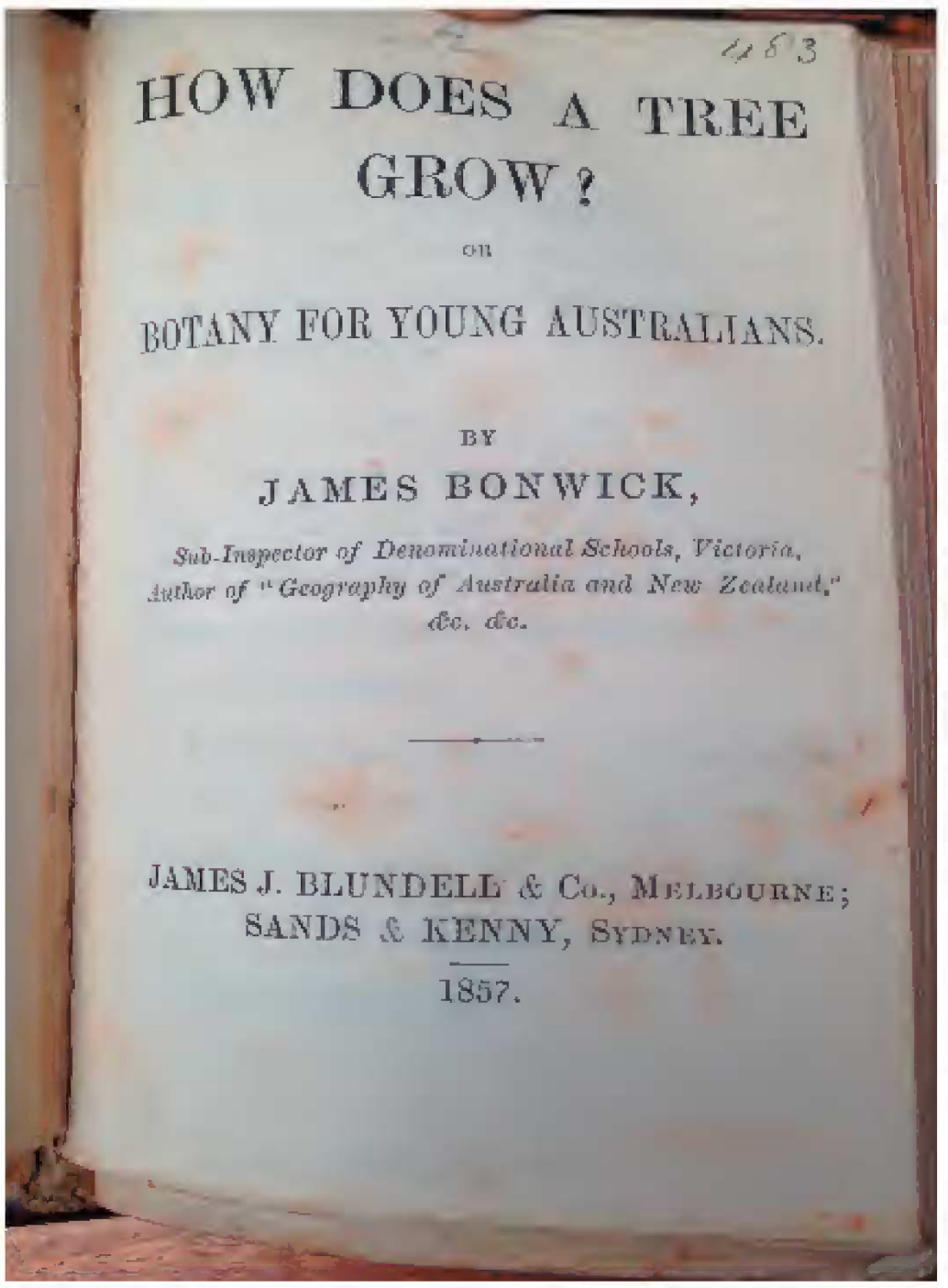


Fig. 2. Sample page from Vere Foster's Drawing Copy Book E1 'Wildflowers'

(including botany and geology). The first Training Institute was established in Victoria in 1870, though the pupil teacher system remained in practice until the 1950s. In 1900 Henry Tisdall had already been employed as a lecturer on botany at the Victorian Teachers' Training College, the first, perhaps, in a line of well known lecturers in Natural History including Herbert Ward Wilson (a noted ornithologist much involved with the Gould League), Norman Wakefield (natural history writer for the Melbourne Age newspaper, and author of the Field Naturalists' Club of Victoria publication on Ferns of Victoria and Tasmania), Jack Hyett ('Jack of the Bush' on early children's television, author, and more than 60 years ago co-founder with William H. King and J. Marion King of the still flourishing Ringwood Field Naturalists' Club) and John Leach (but more of him later). In order to gain a Trained Teacher's Certificate, botany was acceptable as a science. In New South Wales, Sydney Teachers' College opened in 1906.


HOW DOES A TREE GROW?

OR

BOTANY FOR YOUNG AUSTRALIANS.

BY

JAMES BONWICK,

Sub-Inspector of Denominational Schools, Victoria, Author of "Geography of Australia and New Zealand," &c. &c.

JAMES J. BLUNDELL & Co., MELBOURNE;
SANDS & KENNY, SYDNEY.

1857.

Fig. 3. Frontispiece from Bonwick, J. (1857) 'How does a tree grow? or botany for young Australians'

Prior to this a pupil teacher system appears to have been the major option for teacher training, followed by Hurlstone Residential College for women trainees and Fort Street for men.

The earliest book that one could regard as a botanical text written in Australia is that of James Bonwick, in 1857 (Fig.3). Bonwick was Sub-Inspector of Denominational Schools in Melbourne and published many extended pamphlets or tracts on a variety of subjects: history, early colonisation, natural history and science, and even the history of the Methodist church in South Australia. He had arrived in Australia from Britain in 1841 and ended up in Melbourne after a series of none too successful educational endeavours in Hobart and Adelaide, and with a brief period on the goldfields to try and reclaim some of his losses.

Bonwick's book was entitled 'How does a tree grow? or botany for young Australians'. The preface reads – 'At the request of several Teachers I have commenced a series of school books, chiefly to be confined to subjects of colonial history and popular sciences. The form of a dialogue has been adopted with the 'Botany for young Australians' from a belief that the sympathies of our young friends will be excited on behalf of the juvenile questioner and their interest thus maintained in the study of the sciences'. The book is only 42 pages long and addresses the questions to a primary school child. A companion volume was prepared on astronomy. Interestingly the contents of the book were essentially aspects of physiology: that is, how rather than what. How does a plant grow? How does a plant take in water and nutrients? How does a plant manufacture sugars? Such aspects were largely ignored in subsequent Australian texts written in the 19th Century and the early part of the 20th Century.

Only five years later Thomas Ralph wrote his text 'Elementary botany (Australian edition) for the use of beginners'. This elegant little book is only 72 pages long and contains some beautiful if sketchy coloured plates. The book is set out conventionally and covers seeds, vegetative morphology, and flowers. It is based on an English edition, in the preface of which it is stated that the book is written specifically for the English student. At the time of publication, in 1862, Ralph was living in Melbourne (Leslie Cottage, South Yarra Hill, Melbourne) somewhere near the site of the Royal Botanic Gardens. In the preface to the Australian edition he noted that changes had been made to the English edition to include plants 'carefully selected from such as are either cultivated in the colony or to be met with in the neighbourhood of its towns'. If this is the case it is scarcely noticeable, for example in one plate of flowers there is an illustration of a *Goodenia* (Fig.4), and in another illustrating the flowers of the Liliaceae there is a supposed *Burchardia umbellata* but the illustrations omit any botanical detail. Changes of this nature seem to be the extent of the Australianising, but I haven't had the benefit of seeing the English edition and hence making a detailed comparison of either the text or the plates.

The content in Ralph's text book is that which characterises the first part of a number of subsequent texts by other authors. Plant parts are covered in considerable detail but in later books there then follows detail on different aspects reflecting the aims of the author: for example introducing the Australian

Fig. 4. Illustration of Goodenia from Ralph, T. S. (1862) 'Elementary botany (Australian edition) for the use of beginners'.

flora, or introducing principal plants of economic value, especially those of agricultural significance.

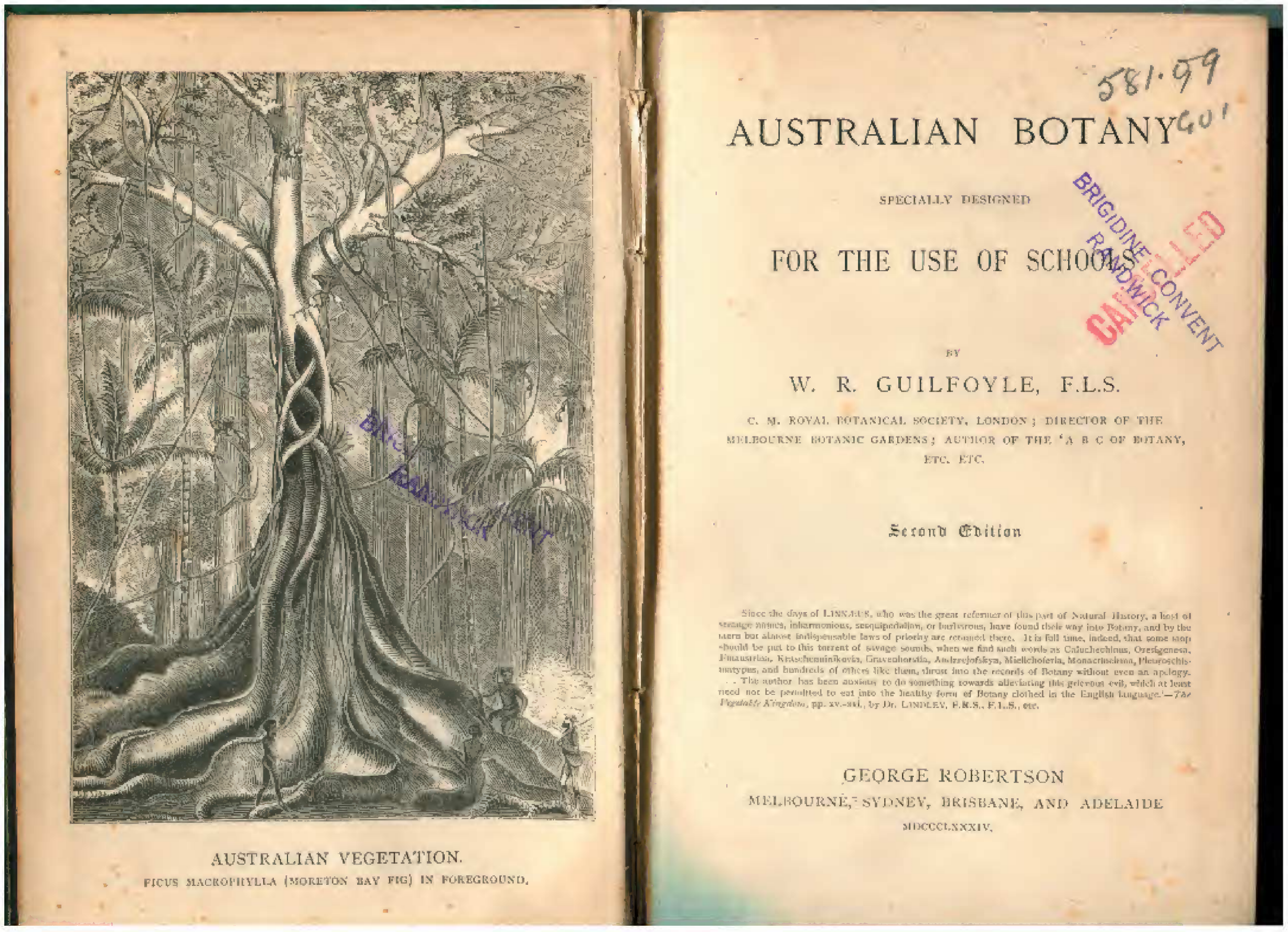
The next two botanical texts published in Australia were written by botanists who, each in their own way, made major contributions as professional full-time scientists. It is interesting to speculate on the fact that these two books appeared within a few years of each other. The authors were Baron Ferdinand von Mueller and William Guilfoyle. Mueller had been appointed Government Botanist in Victoria in 1853, and was Director of the Royal Botanic Gardens Melbourne from 1857 until 1873. He was dismissed because Melburnians (or at least the politicians) wanted a Director of the Gardens with an eye to the aesthetic rather than an emphasis on academic botany. Mueller was dismayed but he did retain his role as Government Botanist (Kynaston, 1981). Mueller's position as Director of the Gardens was taken over by Guilfoyle, a move that was not welcomed by the Baron (Pescott, 1974). At an earlier stage Mueller had described Guilfoyle as a 'distinguished collector' and he even named a genus (*Guilfoylia*) in his honour. When Guilfoyle was appointed Director of the Gardens von Mueller referred to him as 'a nurseryman with no claims to scientific knowledge whatever'. Guilfoyle did however lay out some of the most beautiful gardens in Australia. As it played out Mueller subsequently sunk the genus *Guilfoylia* within *Catellia*. Mueller published 19 papers in the journal of our Society (Proceedings of the Linnean Society of New South Wales): Guilfoyle none.

Given this background one might perceive an element of competition for the hearts and minds of young botanists in the appearance of Guilfoyle's 'Australian botany specially designed for the use of schools' published in 1878, and revised and much enlarged in a second edition in 1884 (Fig.5), and Mueller's 'Introduction to botanic teachings at the schools of Victoria: through references to leading native plants' published in 1877 (Fig.6).

In the first edition of Guilfoyle's text, the preface reads 'In writing this little rudimentary work which has no higher aim than that of familiarising the beginner with the principal parts of plants and their manner of growth, the author has endeavoured throughout to keep in view the suggestion of the great botanist [Dr Lindley] whose words are quoted on the title page.' In summary this advice was 'to avoid the host of strange names, inharmonious, sesquipedalian, and barbarous that found their way into botany. It is full-time indeed that some stop should be put to this torrent of savage sounds and to clothe botany in the English language'.

Subsequent to the publication of the first edition, Guilfoyle also published a small book 'The A.B.C. of botany' (Guilfoyle, 1880) much of which seems to be incorporated in the second edition of his Australian botany text. He noted that this small book (101pp) might usefully be regarded as an introduction to his earlier book.

The second edition of Guilfoyle's textbook (Guilfoyle, 1884) is much expanded and devotes 59 pages to plant parts, 18 pages to systematic botany and the collection and preservation of specimens, a modest



AUSTRALIAN VEGETATION.

FICUS MACROPHYLLA (MORETON BAY FIG) IN FOREGROUND.

AUSTRALIAN BOTANY

SPECIALLY DESIGNED

FOR THE USE OF SCHOOLS

BY

W. R. GUILFOYLE, F.L.S.

C. M. ROYAL BOTANICAL SOCIETY, LONDON; DIRECTOR OF THE MELBOURNE BOTANIC GARDENS; AUTHOR OF THE 'A B C OF BOTANY,' ETC. ETC.

Second Edition

Since the days of LINNÆUS, who was the great reformer of this part of Natural History, a host of strange names, inharmonious, sesquipedalian, or barbarous, have found their way into Botany, and by the mere but almost indispensable laws of priority are retained there. It is full time, indeed, that some step should be put to this torrent of strange sounds, when we find such words as Cauchechinus, Oreogeneas, Pinaustrias, Kretschmaniakovia, Gravenhorstia, Andrzejofskya, Miellichoferia, Monacrinchinus, Pleuroschismatypus, and hundreds of others like them, thrust into the records of Botany without even an apology. . . The author has been anxious to do something towards alleviating this grievous evil, which at least need not be permitted to eat into the healthy form of Botany clothed in the English language.'—*The Vegetable Kingdom*, pp. xv.–xvi., by Dr. LINDLEY, F.R.S., F.L.S., etc.

GEORGE ROBERTSON

MELBOURNE, SYDNEY, BRISBANE, AND ADELAIDE

MDCCCLXXXIV.

Fig. 5. Frontispiece from Guilfoyle, W. R. (1884) 'Australian botany specially designed for the use of schools', Second Edition.

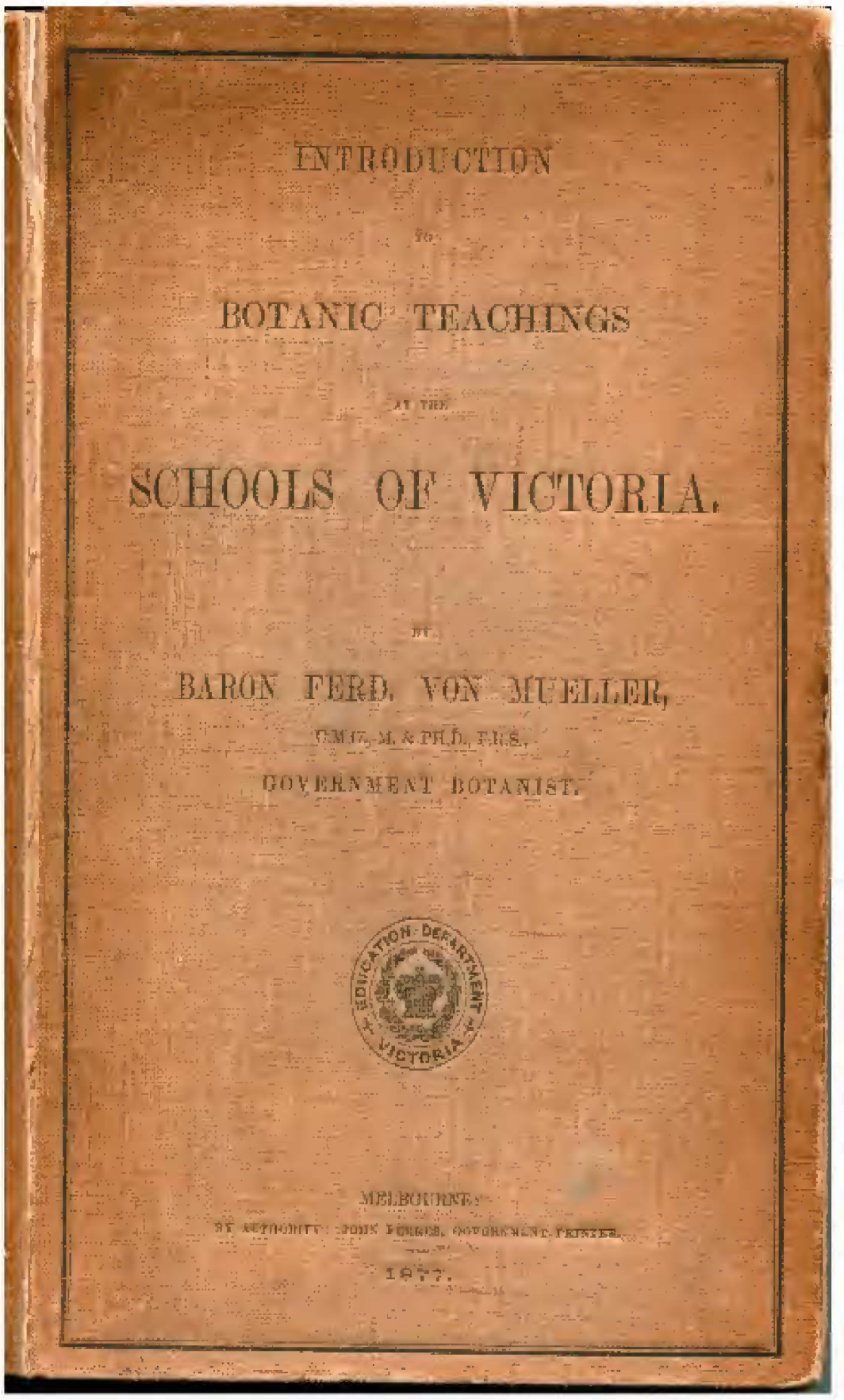


Fig. 6. Front cover of Mueller, F. Baron von (1877) 'Introduction to botanic teachings at the schools of Victoria: through references to leading native plants'.

15 pages to descriptions of Australian vegetation (a chapter written with the object of pointing out to students of botany and others, some characteristics and the beauty of the Australian vegetation) and an extensive glossary of every plant mentioned in the text (about half of which are Australian plants). This was followed by lists of useful plants, and plants common around Melbourne, though many were noted as being found in other states. He acknowledged input from New South Wales and South Australia in what I would regard as an unsuccessful attempt to justify the title 'Australian Botany'.

Mueller's book (Mueller, 1877) is interesting because it demonstrates a novel plan for teaching botany. He took the view that traditional teaching of botany was 'wearisome alike to the teacher and the children and that the knowledge gained from most elementary works on botany is as quickly lost as gained'. He wished to involve students in observations made on the native plants in their own locality and only afterward to move to the (more difficult) study of anatomy and physiology of plants. In the preface he notes that he had commenced a book to be known as the 'Victorian School Flora' but on ministerial request was required to give precedence to other work, and that even in writing the present book had been asked (or directed?) to 'abandon as much as ever possible scientific terms names and appellations'. Mueller's book was published by the Victorian Government Printer: Guilfoyle's books were commercially published. Mueller noted that those wishing to undertake traditional studies could adopt books published in England, 'all meritorious in their way.' He was anxious that the general population should be introduced to the plants in their environment and had been sending out pressed and dried plants with printed notes in Atlas form under the title of 'Educational Collections'; these being made available to the public through Mechanic Institutes and free libraries. As his book is based on the local flora it is genuinely Australian even if the species chosen are Victorian.

If we regard the books by Guilfoyle and Mueller as competitors how do we assess the outcome? Guilfoyle was clearly more successful, and notes in 1884 that he had much pleasure in saying that, 'owing to the demand for the first edition having exhausted the issue, and from the flattering notices appearing in nearly all sections of the press, it had become necessary to issue a second edition'. The flattering notices in the press included those from the Castlemaine Representative, the Horsham Times, the Geelong Advertiser, the Warrnambool Guardian and Examiner, the Ballarat Star, and even the Sydney Telegraph. As a botanist Mueller's legacy is more significant and the excellent illustrations from his book appear in various guises, often simplified, in a number of later books (Figs.7a,b).

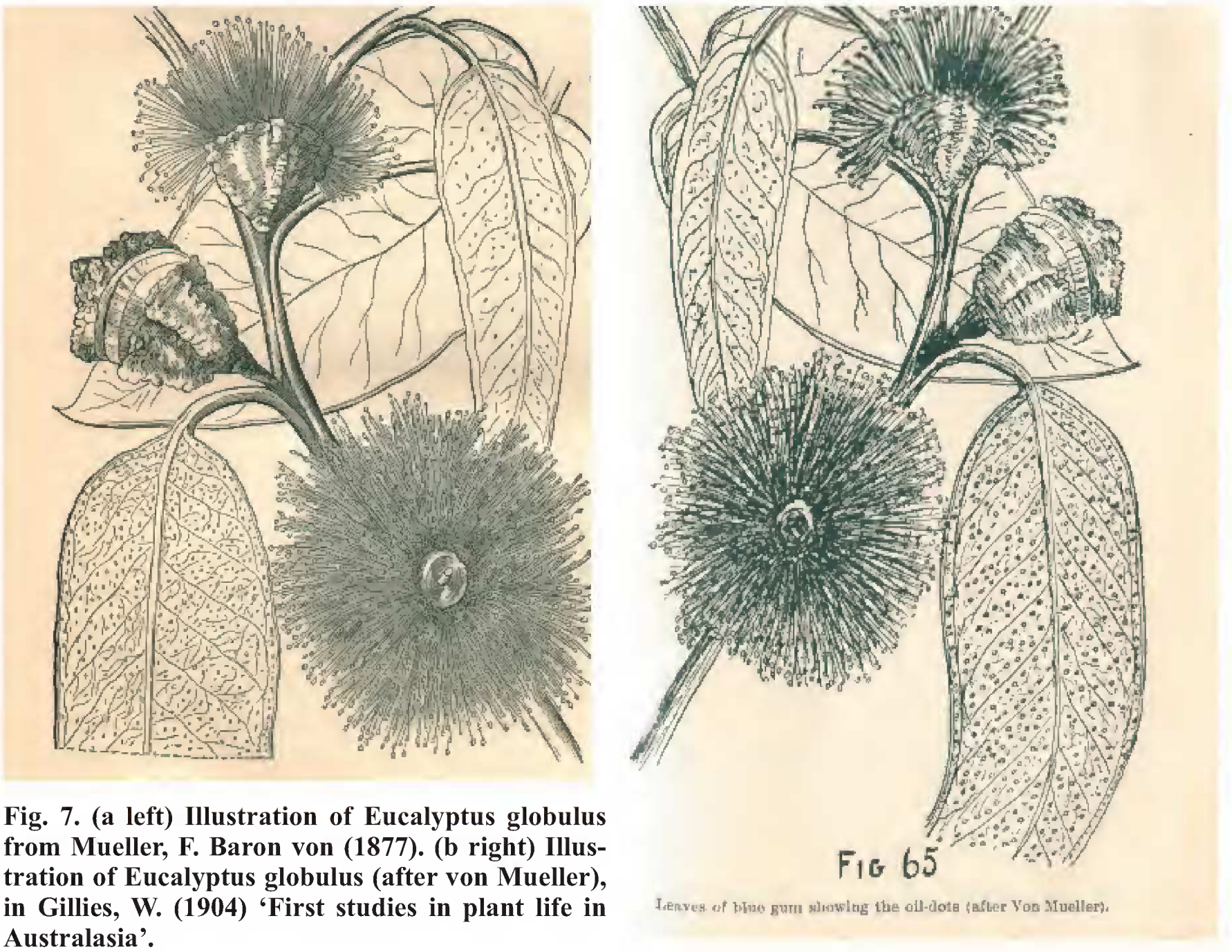


Fig. 7. (a left) Illustration of Eucalyptus globulus from Mueller, F. Baron von (1877). (b right) Illustration of Eucalyptus globulus (after von Mueller), in Gillies, W. (1904) 'First studies in plant life in Australasia'.

1892 saw the publication of Arthur Dendy and Alfred Lucas' 'An Introduction to the study of botany with a special chapter on some Australian natural orders'. The book was dedicated to Baron Sir Ferdinand von Mueller. The first half addressed general botany with considerable emphasis on lower plant groups as well as the algae, the fungi, and bacteria. The second section on flowering plants concluded with a lengthy chapter on the characteristics, distribution and uses of some of the more important Australian flowering plants. Dendy wrote the first section. In 1888 he had moved from Manchester to Melbourne University and was the first zoologist to study Victorian terrestrial invertebrates. He was subsequently Professor at Christchurch, Cape Town and then King's College, London. He published three papers in the Proceedings of the Linnean Society of New South Wales. Lucas was perhaps better known. He had taught at the Leys School in Cambridge but for health reasons migrated to Australia. At the time of publication of this text he was Senior Fellow at Queens College, Melbourne University. He later published 'The Seaweeds of South Australia'. Lucas by no means confined his interests to botany: with William Le Souef, he wrote 'Animals of Australia' in 1909, and later 'Birds of Australia' in 1911. Lucas was a Council member of the Linnean Society of New South Wales for some 42 years, and President from 1907-1909. He published 16 papers in the Proceedings of the Society.

To this point all of the publications I have mentioned emanate from Melbourne. What was happening elsewhere? Not much apparently. In Queensland Frederick Bailey (Colonial Botanist to Queensland) published 'A companion for the Queensland student of plant life' in 1893, and a year later 'Botany abridged, or how to readily distinguish some of our common plants to which are appended a few additions to the companion for the Queensland student of plant life'. These were reissued together in 1897. These two pamphlets, one 108 pages and the other only 24 pages, are scarcely textbooks. The preface to 'Botany abridged' states that 'the only object the writer has in issuing these few pages is that they may be the means of assisting school teachers to readily name some of the more common plants which may be brought to them by students .... and if teachers in their turn point out their distinguishing marks to the young, a habit of observation would

thus be engendered which could not fail to be of service to them in after life'. In these publications Bailey eschews the dictum espoused by Guilfoyle, and dictated to Mueller by his political masters, with regard to terminological obscurantism and exactitude. Primary school teachers were introduced to conivent and connate anthers to solve any confusion between the Apocyanaceae and the Asclepiadae.

We now mark the end of the 19th Century with Henry Tisdall. His book, 'Students' botanical notes' was published in a second edition in 1900 (I've not been able to locate a first edition nor any details). These were notes that contained the substance of a course of 32 lessons in elementary botany delivered during each of the four preceding years. At that time he had held a Lectureship in Botany at the Victorian Teachers' Training College. His emphasis was on plant groups (including the fungi and the algae), plant parts and there was a little on function.

A new century dawned but nothing much changed in terms of botany teaching, at least as far as can be gleaned from the publications available.

In 1904 William Gillies published the first edition of his 'First studies in plant life in Australasia' with numerous questions, directions for outdoor work, and drawing and composition exercises. He suggested that plant physiology could be postponed to a later stage. In his view 'a wise mingling of authoritative and experimental teaching was probably the best method at the early stages'. As he pointed out in his preface telling a child that a snapdragon flower is personate and bilabiate, with didynamous stamens and a two lobed superior pistil may make children tired but if the flower is described in terms of its function (a curious mouth due to visits from bees) they will listen readily.

Gillies and with few exceptions all other authors of botany textbooks up to this time were from Victoria. Why have I bothered to make that point? I do so because I want to draw attention to the key role of the Field Naturalists' Clubs in Victoria in creating public awareness and promoting the study of natural history. Almost all of the texts up to this time acknowledge some sort of input from the Field Naturalists' Club of Victoria, its publications and its members. There was not an equivalent organisation of such influence in New South Wales, though various Field Naturalists' groups have existed and continue to exist. To a certain extent the Linnean Society of New South Wales has fulfilled a similar role although with a greater emphasis on the underlying sciences.

I have already alluded to the key role that lecturers in nature studies at Victorian Teachers' Colleges played, none more so than John Albert Leach, Supervisor of Nature Study in Victorian Schools and later Assistant Chief Inspector of Schools in Victoria, and co-founder with Jessie McMichael of the Gould League of Bird Lovers in 1909. Leach's contribution was enormous, but here I'll limit myself to comments on his book 'Australian nature studies' which was continuously in press from 1922 until at least 1952. Though not a botany text *per se* it included significant botanical information, even some plant physiology. At the end of its 500 pages there was a table suggesting a graded series of lessons for pupils in grades 1 to 8 (age 4.5 - 6 up to 13 years) for every week of the school year as the backbone for 'morning talk' or the 'nature table' and where possible the morning walk (Fig.8). As a text it is unsurpassed and its influence was widely felt.

In contrast to the early period most of the textbooks on botany in the early 20th Century originated from New South Wales and the majority is written by women. I'm afraid that there appears to be an element of Linley's 'Ladies botany' resurgent. A friend recalls that in her north coast convent school botany was the only 'science' offered to the girls: it was cheap to teach and seemly. As Eric Ashby commented 'No one doubts that the chemist needs flasks and gas points and sinks. No one questions the need for benches and lenses and galvanometers for physics. But it is still assumed botany can be taught in any classroom with no other aids and a pencil, a south light, and one antiquated microscope' (Ashby in the preface to Carey, 1941).

In 1916 Agnes Brewster and Constance Le Plastrier published their successful textbook 'Botany for Australian students' designed for the NSW Intermediate Certificate. There were at least four editions, with the fourth published in 1930. The 1916 edition covered general descriptive botany and included a detailed section on systematic botany. In the preface the authors expressed a view that the study of botany in Australia had scarcely reached the stage of understanding the ecology. In the expanded second edition there were 63 pages devoted to ecology essentially that of the Sydney region and drawing on research papers and illustrations of R. H. Cambage and A. A. Hamilton, published in the Proceedings of the Linnean Society of New South Wales. Brewster herself was a member of the Society and published one research paper in the Proceedings.

In 1929 Brewster published a companion book 'Botany for Australian secondary schools' to take students on to the NSW Leaving Certificate. This book further developed the ecological aspects citing 16 research papers, 11 from the Proceedings of the Linnean Society of New South Wales. Le

AN EIGHT YEARS' COURSE OF STUDY.

SUGGESTED TOPICS.

During February, grade teachers should draw up a suggested series of weekly lessons for their grade for the year, compare the series with those of the grades above and below, and see that each topic selected is suitable to school and locality, and fresh to the pupils. Schools situated near the sea should have several beach lessons in each grade. The following suggestions name many seasonal topics for each week. Rearrange the order to suit season and locality. It has been found **necessary to impose two restrictions on a free choice of subjects. Fresh lessons** must be left for Grades VI., VII. and VIII., and repetition of lessons given in lower grades must be avoided. Give the lessons asterisked (if suitable), and, for the balance, substitute as many local subjects as possible, provided that the work of a higher grade is not encroached on, and that past work is not repeated. No subject should appear more than twice in a six years' course, or more than three times in an eight years' course. Seed-scattering and fruits must be spread over the eight grades, therefore reserve seed-scattering for Grade VI., and fruits for Grade VIII. When Grades VII. and VIII. take nature-study in lieu of science, fresh work must be done by these grades. No subject is to be taken, unless it is amply illustrated with specimens and necessary experiments, and is suitable to season and locality. Give one lesson a week regularly. Some nature-study lessons are geographical, and geography will not suffer if the succeeding lesson, when a holiday or school emergency intervenes, is devoted to nature-study. Experiments in Grades V. to VIII. should be on hand from April until September, at least. When an experiment has served its purpose, another should be substituted. **Announce each lesson at least two weeks in advance.** Use the second lesson if specimens are not available for the first; substitute local subjects; allow full freedom in the morning talk, except that it should not encroach on coming lessons; and make the work pleasant.

Week ending about—	Grade VIII. Age 13 years.	VII. Age 12.	VI. Age 11.	V. Age 10.
Jan. 29	*Dry fruits ..	Prickly Pear or Cactus	*Seed scattering ..	*Explosive fruits (gorse, etc.)
Feb. 5	*Edible fruits ..	*How plants reduce loss of water	*Water and life or Transpiration	*How seeds are protected in fruits
„ 12	Seaweeds or Swamp plants	Crayfish or Crabs	Aphis or Stinging Animals	Univalves, Dock or Oleander
„ 19	Fish (kinds); Drought & plants	Beetles or Sea-mats and Sea-ferns	Scale insects or Sea Worms	Bivalves, Fish or Mussel
„ 26	Wingless insects or Shore formation	White ant or Eggs of sea animals	Ladybird and L.H. or Head-footed animals or Apple	Shrimp, Casemoth or Goatmoth
Mar. 4	Insect heads and bodies or Shore vegetation	Galls or Straight-winged insects	Grape vine or *Migration of birds	Ant or Boxthorn
„ 11	Insect wings; Bacteria and decay; Bird migration	Ants and other animals or Many-legged animals	*Mosquitoes, I. ..	Ant homes and L.H.; Mantis
„ 18	Insect legs; Colours of animals	Moulting of birds or Wasp	*Mosquitoes, II. ..	Blackberry plant; Rose plant
„ 25	Insect mouth parts or Mimicry	Maize or long-feelered grasshoppers	*Equinox place and time of sunrise and sunset	Cockroach or Sunflower
Apr. 1	Destructive insects or Bird families	Scale-winged insects or Thistles	*Mould and mushroom; Burying Beetle	Spider or Twining plants
„ 8	Beneficial insects or Cause of winds	Fig or Vegetables	Fall of leaf (expts)†	Spiders' webs and homes
„ 15	Seedlings or Cyclones and anti-cyclones	Sucking-beak insects or Rain and life	*Germinations (onion, sunflower, maize, pine, date)	*Pea-seed
„ 22	Food constituents or Growth in nutrient solutions	*Percentage germination and seed-testing	*Seed leaves and uses	*Pea and wheat germinations
May 6	Fungi or Spiders	*How nature plants seeds or Earwig	*Feeding of plants (expts.)	*Conditions for growth (expts.)
„ 13	Branching of trees or Variation	Toadstools and puffballs	*Leaf arrangement & mosaics (exp.)	*Food (expts.)
„ 20	Wood and timber; Increase of animals and plants	*Dew and its causes	*Leaf shape and edges (expts.)	*Work of leaf (expts.)
„ 27	Timber destroyers or Struggle for existence	Modifications and kinds of leaves	*Plants breathe (expts.)	*Leaves need light (expts.)
June 3	Vegetation & water flow or Balance of nature	Modifications of roots	*Kinds of roots & experiments	Leaves and water (expts.)
„ 10	Eucalypts or How animals winter	Stems and ascent of sap	*Kinds of stem & experiments	*Work of root and osmosis (expts.)
„ 17	Granite or Moon or District geographical features	Evergreen trees or Pebbles	*Plants feel .. (expts.)	*Work of stem (expts.)
„ 24	Volcanic rock or Tides or Rainbow	Bark or Teeth of animals	*Solstice; place & time of sunrise and sunset	*Resident birds

* Lessons marked * should (if practicable) be given.

SUGGESTED TOPICS.

Week ending about—	IV. Age 9.	III. Age 8.	II. Age 7.	I. Age 6—4½.
Jan. 29	*Hooked fruits or Bathurst burr	Winged and hairy seeds	How plants drink or Milk	Summer or Cat
Feb. 5	Sponge or Marigold	Fruits that are not eaten or Pigface	Apple tree in summer	Thistle Seed or Dog
„ 12	Starfish or Sow thistle	Couch grass; Looking glass bush	Apple ..	Plum
„ 19	Sea-urchin or Leaf miner	Tomato or Seaweeds	Peach, Grape or Cockroach	Water and forms or Housefly
„ 26	Grasshopper or Thistle	Pear or Sea-animals	Emperor gum moth or Galls	A live fish or Cricket
Mar. 4	Caterpillars or A dust storm	Aphis or A beach	Crabs or Seed-boxes	Casemoth or a Caterpillar
„ 11	Leaf-rollers or Cosmos	Insect homes or Scale insects	Shellfish or Mosquito larvae	Dandelion
„ 18	Snapdragon or Click beetle	White grub or Marguerite	Blackberry; Mosquito pupae	Ants and homes
„ 25	Plants used for food or Weevil	Equal day and night	Sunflower ..	Autumn flowers or Thistle
Apr. 1	Cricket or Moreton Bay fig tree	Burrowing animals or Cupmoth larvae	Emperor gum caterpillar	Autumn leaves
„ 8	Bonfire salvia ..	Mushroom ..	Spider and web or Fig	Rose plant
„ 15	Dolichos ..	Growing wheat seed	Growing broad bean	Growing pea-seed
„ 22	*Autumn leaves ..	Virginia creeper or Chrysanthemum	Ivy or Robin ..	Growing acorn and carrot
May 6	Slater or Tendrils	Pepper tree ..	Apple tree in Autumn	Winds; Mushroom
„ 13	Clothes moth or Hawthorn	Galls or Plane tree	Emperor Gum cocoon and pupa	Dewy and frosty mornings
„ 20	Prickly plants or Loquat tree	Sweet briar or Sky pictures	Rain and fog ..	Baby plant and growth, or pea plant
„ 27	*Eucalypt ..	Earthworm ..	Pond animals ..	Our teeth
June 3	Eucalypt friends	Growth of wheat	Pond Plants or Moon	Our fingers and toes
„ 10	Eucalypt foes ..	Trees in winter ..	Broad bean plant.	Our senses
„ 17	Tree planting or Bark	Evergreen trees ..	Log of wood or Earthworm	Clouds
„ 24	Soil or Firewood	Shortest day ..	Apple tree in winter or Cow	Water and forms

†Lessons marked † should be illustrated by experiments working from April to September.

Fig. 8. 'An Eight Years' Course of Study' from Leach, J. A. (1922) 'Australian nature studies; a book of reference for those interested in nature study'.

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Plastrier (1933) also wrote another book 'The story of our plants, first steps in Australian botany'. It was described by David Stead (then editor of the Shakespeare Head Australian Nature Series) as a pocket botany, to act as 'a kind of literary footstool on which the general enquirer and the young student might stand, to reach the really excellent library of more advanced Australian botany'.

Other texts in this period included Cooke and Gillham (1932) and Catley (1934). 'A first year Australian botany' by Elsie Cooke and Myrtle Gillham is a short text two thirds of which are devoted to plant parts and the illustrations, mostly of European species. These are followed by a page or two on some major Australian plant families, and a couple of pages on the collection of plants. Allan Catley's 'An intermediate botany' was published two years later and there were revisions and reprints through to 1946. Catley was sometime Lecturer in Nature Study and Agriculture at Armidale Teachers' College. His book presents another more or less standard (perhaps even more old-fashioned) coverage of plant parts and types of plants with a major emphasis on agricultural species. It does present a discussion of subjects with appeal to pupils in rural districts.

A welcome departure was Gladys Carey's 'Botany by observation - a textbook for Australian schools' published in 1941. As Eric Ashby noted in his foreword to that book, textbooks for Australian students were out of date with regard to experimental botany with an emphasis on aspects of plant morphology no longer considered suitable for elementary classes. While recognising there were good modern texts written in England and America he believed the whole purpose of teaching botany at school was defeated if it didn't give children an appreciation and enthusiasm for their own environment; this he considered to be common sense not narrow provincialism. Ashby contended that Carey's book contained up-to-date physiology, promoted observation [a good thing], and was accurate in its statements on ecology and physiology.

I've taken Carey as my arbitrary cut-off date for this survey of early Australian botanical teaching literature, almost a century after the publication of Bonwick. I should add that I have deliberately avoided reference to Newman (1946) and McLuckie and McKee (1954), both written for University studies and neither (but especially the former) likely to enthuse students to take up botanical studies. Ivor Newman, it should be noted, was one-time Linnean Macleay Research Fellow (of the Linnean Society of New South Wales) at the University of Sydney.

From the 1950s the teaching of botany moved from being a central and stand alone pillar of science teaching to being incorporated into a more broad ranging view of biology. The launching of Sputnik by the Russians prompted a dramatic reassessment of science teaching in the United States with the development of new teaching materials in science, with a particular emphasis on biology (Biological Sciences Curriculum Studies) through the National Science Foundation and the American Institute of Biological Sciences. At that time biology was the only science subject studied by more than half of American students. A similar phenomenon occurred in Australia with the production of the landmark 'The web of life' by the Australian Academy of Science, a book that exhibits both the advantages and disadvantages of a book written by a committee. In New South Wales the secondary school syllabus for biology was regularly revised such that by the time I co-authored the textbook 'Senior biology' in 1991 very little of the Higher School Certificate syllabus would have been recognised as botany by the authors of the 19th Century. It had been scaled up with an emphasis on environmental interactions, ecology and conservation, and scaled down with a greater emphasis on microbiology, biochemistry and molecular genetics. Furthermore far greater attention was being paid to ways in which biology affects day-to-day life (human disease, food production, human impacts).

One major consequence of this shift in curriculum has been that aspects of traditional botany appear to have been downgraded, disregarded or dispatched from the curriculum. Whereas once almost every Australian university would have had a separate School of Botany there is now no university where that is the case. The last standing School of Botany, at Melbourne University (a world-class School of Plant Science) has become in 2015 part of the new School of Biosciences. At the University of New South Wales botany is now taught in a School of Biological, Earth and Environmental Sciences – so goodbye to traditional zoology, geology and physical geography as well as botany. Similar changes have been made across Australia. This is perhaps not all bad and I don't want to sound like a grumpy old botanist but having been educated as a traditional zoologist and botanist I do believe we have lost something valuable.

Addressing only one such loss Pat Hutchings and Penny Berents have written, 'We won't know what species we have and what species we're driving to extinction. Taxonomists - those people who name animals and plants and who worry about the relationships between them - are becoming increasingly rare. You might even say that they are becoming an "endangered species". However, the

work of taxonomists underpins biological sciences and is fundamental in managing biodiversity'. They point out that the conservation of world biodiversity is a global priority. In 1992, 150 countries (including Australia) signed the United Nations Convention on Biological Diversity in Rio, committing Australia to conserving biodiversity (Australian Museum blogpost, 2015).

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